Report Type:	**White Paper**
Grant Number:	**HD-248544-16**
Project Title:	**Time Online**
Name of Project Director:	**Daniel Rosenberg**
Name of Institution:	**University of Oregon**
Date Report Submitted:	**February 27, 2020**

Time Online White Paper

1. Introduction

Time Online is a collaborative, interdisciplinary research project on the use of graphic tools in the study of history. The project takes up problems first explored in the book *Cartographies of Time: A History of the Timeline* by project investigators Daniel Rosenberg and Anthony Grafton, and applies to them a digital methodology. In Time Online, we examine old chronological charts, extract their data, and analyze their rules, giving us a precise understanding of how they work. We then write algorithms that permit a computer to redraw the charts using the original data as well as data from other sources. In reconstructing the charts, we create new functions that enhance their interactivity and extend their capabilities. We also provide new insights into how and why the original charts were made, and the impact that they had in their time. Our project pioneers a new kind of digital publication exploring, on the one hand, how digital tools help us understand history, and on the other, how history offers lessons for contemporary digital design.

2. History

The Time Online project was initiated in 2013 when Professor Rosenberg began an experiment with a small team of researchers at the University of Oregon Digital Scholarship Center to study and digitally reconstruct a long-forgotten chronology game designed in 1892 by the American humorist Mark Twain that Rosenberg and Grafton had examined briefly in their book. This initial work was supported by a University of Oregon Faculty Start Up Grant and a University of Oregon Faculty Research Award. Its goal was to understand the underlying logic of Twain's game by analyzing it and then reconstructing it digitally. This involved historical research on the one hand—resulting in new archival discoveries in the National Archives in Washington, DC and at the Mark Twain Papers at UC Berkeley—and digital design on the other. Our work on Twain was presented in the form of essays and artifacts crafted for the Web as well as three playable digital versions of Twain's game. Twain's game proved to be an especially generative subject of study because the logic of a board game resembles in many ways the logic of a computer program and because Twain had written extensively and insightfully on the challenges of the design process as such. Our success working on the Twain game convinced us that we had an approach that could be fruitfully applied to other graphic artifacts. This inspiration was the basis of our NEH Digital Humanities Start Up Grant proposal.

3. Activities

In 2016, on the strength of our initial work, the Time Online project received NEH Digital Humanities Start Up Grant HD-248544-16 to conduct further digital experiments exploring the graphic representation of historical time. In our grant application, we proposed sketching out a "trilogy of trilogies," a total of nine programming modules of roughly the same scale as our module on Twain, three representing visualizations of time from the seventeenth century, three from the eighteenth century, and three from the nineteenth century. We proposed further that we would complete an initial version of our nineteenth-century trilogy, as well as the background research and a detailed plan for our eighteenth-century modules.

To conduct this work, we expanded our team, founding an advisory board including faculty at Oregon, Princeton, Stanford, UC-Irvine, and Texas A&M, and involving three laboratories, the University of Oregon Libraries Digital Scholarship Center (DSC), the University of Oregon InfoGraphics Lab (UOIL), and the Stanford Center for Spatial and Textual Analysis (CESTA). The Digital Scholarship Center would develop the first trilogy. The Infographics Lab would develop the second trilogy. And CESTA would offer advice and counsel. Were further funding ultimately to become available, we proposed suggest that the final trilogy and a comprehensive web site might be designed in partnership with CESTA.

Over the course of our grant, our core team has included:

Daniel Rosenberg, Principal Investigator
Anthony Grafton, Co-Investigator
James Meacham, Project Director
Sheila Rabun, Project Manager
Joanna Merson, Lead Programmer
David McCallum, Lead Designer

Using the NEH grant, our DSC team completed and published a first version of our nineteenth-century trilogy. We finished the work we had begun on Twain, and then applied a similar approach to two other nineteenth-century chronographic tools, an 1885 chart with moving parts called *Ludlow's Concentric Chart of History* by the New York minister and writer James Ludlow, and a system of historical mnemonics from 1850 called the *Polish-American System of Chronology*, adapted from the system of the Polish writer Josef Bem by the pioneering transcendentalist educator Elizabeth Palmer Peabody. We published working versions of all three of these interactive tools along with critical commentary on a website hosted by University of Oregon at https://timeonline.uoregon.edu/ .

Because we were able to complete this first trilogy efficiently, we set a more ambitious goal than we had initially articulated in our NEH grant application for the next phase of our work. Rather than three charts, our second "trilogy" would contain four, the 1750 *Mappe-Monde Historique* by the French cartographer Jean-Louis Barbeu de la Bruyère, the 1765 *Chart of Biography* and 1769 *New Chart of History* by the English scientist and theologian Joseph Priestley, and the 1804 *Strom der Zeiten* by the pedagogical writer Friedrich Strass. We decided to build these charts in a common programming environment so that they could interact with one another. We opted to develop a much more robust set of exploratory tools for these charts than we had previously achieved so that users could explore the data contained in these charts using modern as well as historical tools. And we set our sights on getting all the way through to publication for the two Priestley charts, rather than only the initial research and design discussed in our NEH application. For this phase of our work, we shifted our center for operations from the Digital Scholarship Center to the InfoGraphics Lab, with its specialized knowledge of digital cartography.

After initial research and development, we built proof-of-concept models for the Priestley charts and submitted these along with a proposal to the Stanford University Press (SUP) Digital Projects Series, where they underwent anonymous peer review and were accepted for publication

as *The Time Charts of Joseph Priestley*. We then began to build out our Priestley models. At the conclusion of our NEH grant, we were roughly three-quarters of the way to completion of our work on the Priestley charts and our SUP publication.

Functionally, the first three modules that we designed were independent of one another. Though the research and design process for each informed the others, and though we grouped our investigations and reconstructions of these artifacts together into a single Time Online website, the programming approach to each was independent. For each, we evolved our design according to our understanding of the individual object.

Each of these early components of our project was a compelling research experience research. As we deconstructed and reconstructed each artifact, the programming process forced us to specify rules that the creators of the original objects, employing print media, largely left implicit. The design questions raised by our objects differed, and we learned something different from each. In our study of *Mark Twain's Memory Builder*, we focused on gamification; in *Ludlow's Concentric Chart of History*, we looked at the problem of translating the physical functions of paper to a digital medium; in the *Polish-American System of Chronology*, we looked at problems of logic, memory, and visualization.

Through these experiments, we developed the expertise to execute our reconstruction of Joseph Priestley's charts, which are more complex graphic artifacts than the ones with which we had begun, and which, treated together as a single problem, offer still further complexities to manage. In our first three modules, our aim was to look at artifacts that were very different from one another, to gain a variety of perspectives on our problem. In the case of Priestley, our aim was to study and understand the two most influential time charts of the eighteenth-century. In so doing, we hoped to do more than simply to add *more* artifacts to our collection but to articulate the rules of a visual system that continues to dominate representations of chronological time down to the present day. Moreover, in building a shared environment for the two charts, we hoped to generalize the questions we were asking and to explore the potential of these charts as a new model for a digital chronographic approach. In addition, we researched for and planned future design work around two diagrams that either influenced or were influenced by Priestley, Barbeau de la Bruyère's 1750 *Mappe-Monde Historique* and Strass's 1804 *Strom der Zeiten*.

Through our earlier work, we also honed the scholarly questions we were asking. Among these, two in particular stand out. First: How and to what extent were eighteenth-century time charts *algorithmic*? In other words, to what extent was the data represented in these charts collected and structured like the data that we commonly process with computers today? To what extent were the manipulations to which this data was subject in the historical charts bound by rules of the sort that computers apply? And what would happen if we instructed a computer to draw the way that our historical subjects drew? Second: How and to what extent were eighteenth-century time charts *cartographic*? Print-era *chronographers* such as Priestley aspired to achieve a revolution in the graphic representation of time parallel to the revolution in spatial representation achieved by the *cartographers* of the seventeenth century. How strong was the parallel that they achieved? And what insights can their work offer about how to adapt GIS and other modern digital cartographic systems to the demands of contemporary *chronography*?

4. Accomplishments

A large part of our work can be viewed on our website https://timeonline.uoregon.edu/ . This includes the initial versions of all three artifacts in our nineteenth-century "trilogy." It also includes a link through to a development version of our work on Priestley's two charts which will eventually be published by Stanford University Press. We have recently stopped updating that development link regularly, as we are moving toward completion and production of our version of the Priestley charts for SUP, which itself will be the most significant accomplishment of our project. We anticipate publication late in 2020 or early 2021. When published, our Stanford website will include a thorough discussion of our process and methodology and the historical and critical derived from our digital work. All of our data will also be available there, and all of our code will be open source.

Our group has published a number of articles and public presentations related to our work, listed below.

Website:

Time Online: https://timeonline.uoregon.edu/

Print Publications about Time Online:

Daniel Rosenberg, "Time Offline and On," in *Proofreaders and Polymaths*, ed. Ann Blair (Leiden, NL: Brill, 2016), 974–98. (Included in this PDF)

Print Publications about the Time Online project:

Jason Stone, "Digital Age, Paper Machines," *Building Knowledge* (Spring 2016), 14–20. (Included in this PDF)

Talks:

Daniel Rosenberg, "Early Modern Data Storytelling," Agora Center for Journalism, University of Oregon, Portland, OR, 18 April 2016.

Daniel Rosenberg, "Against Infographics," SPARK Arts + Science, Oregon State University, Corvallis, OR, 3 May 2017.

Joanna Merson, Daniel Rosenberg, James Meacham, "Transforming Priestley's 1769 Timeline into an Interactive Infographic," North American Cartographic Information Society Annual Meeting, Norfolk, VA, 17 October 2018. https://nacis2018.sched.com/event/FMLY/practical-cartography-day-early-afternoon-session

Ben Elan, Joanna Merson, Daniel Rosenberg, James Meacham, "Building the UO for Priestley's Interactive Timeline," North American Cartographic Information Society

Annual Meeting, Norfolk, VA, 19 October 2018.
https://nacis2018.sched.com/event/FML7/web-and-mobile-mapping-ii

Daniel Rosenberg, "Seeing Data," Museum of Modern Art, 5 September 2018.

Joanna Merson, Daniel Rosenberg, Ben Elan, James Meacham, "Interactive Development on the Priestley Timeline, A New Chart of History," Portland Cartography Symposium, Portland, OR, 2 March 2018.

Daniel Rosenberg, "Time Online," Max Planck Institute for the History of Science, Digital Humanities Group, 16 May 2019.

Daniel Rosenberg, "Nivi Alroy's Cartographies of Time," Herzliya Museum of Contemporary Art, Herzliya, Israel, 29 June 2019.

Daniel Rosenberg, "Time Online," Bibliotheca Herziana, Rome, Italy, 25 February 2020.

Other Publications deriving from the Time Online project:

Daniel Rosenberg, "Against Infographics," *Art Journal* 75:1 (Winter 2016) (cover article), 38–57.

Daniel Rosenberg, "Date Painting," *LA+ Journal* (Fall 2018), 62–7.

Daniel Rosenberg, "A Map of Language," in Kären Wigen and Caroline Winterer, eds. *Time in Space* (Chicago: University of Chicago Press, 2020).

5. Audiences

We have designed all of our work to be approachable by a general audience as well as users from specific interest groups, notably scholars of history and of infographic design. The work that we have published on the Time Online website ranges from games to galleries to scholarly essays. Our most polished work to date will appear in our Stanford University Press publication, *The Time Charts of Joseph Priestley*, and we will know much more about the audiences for our online work once our that work is released.

6. Evaluation

Our project underwent a rigorous, anonymous peer review process at Stanford University Press, on the basis of which we were awarded a publication contract. We are currently applying for continuing funding from several granting organizations including NEH. As with audience, we will be able to answer this question in greater depth once the SUP project is published.

7. Continuation of the Project

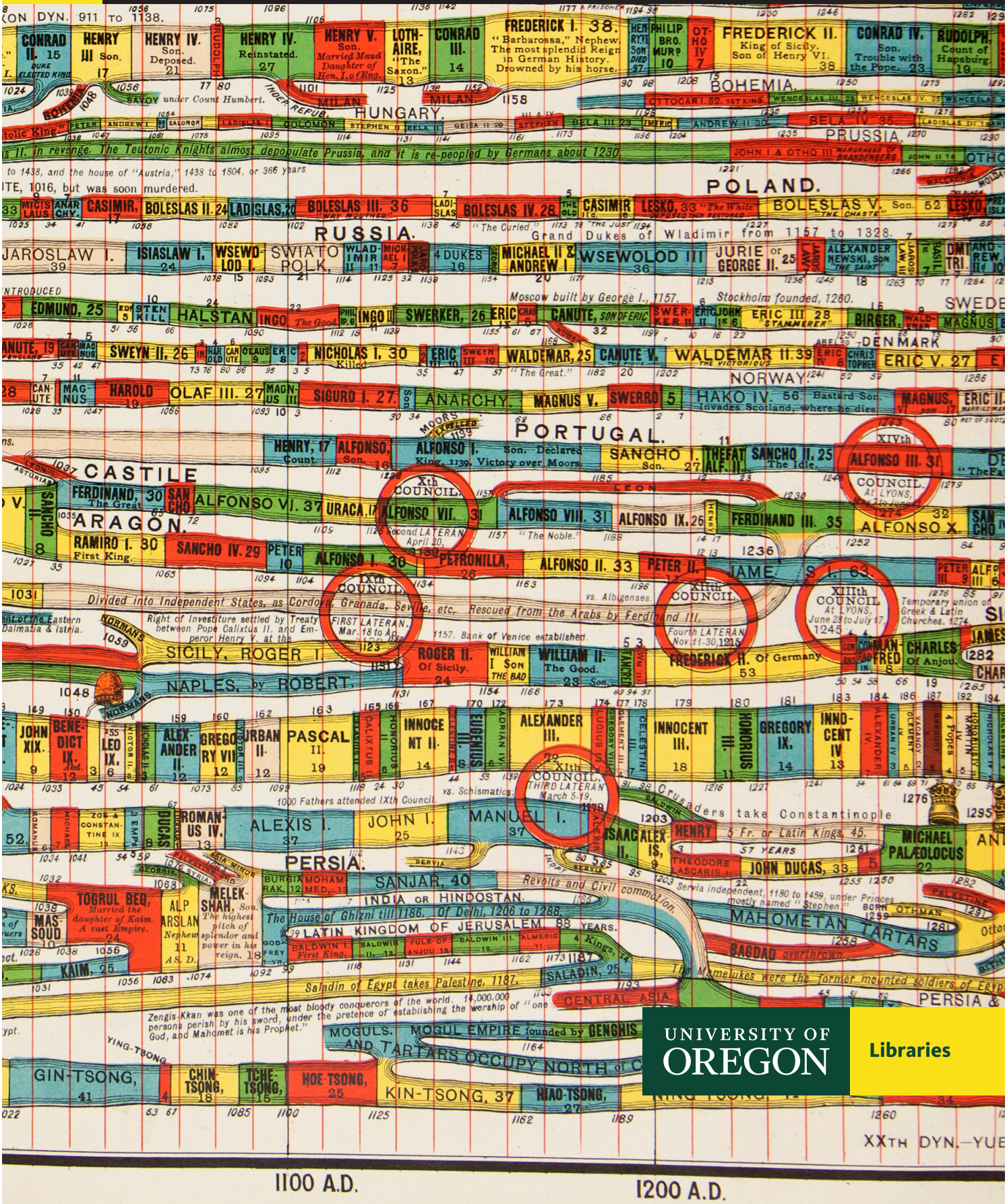
We aim to continue this project for at least two more years. Our first goal is to complete our SUP publication. To complement that publication, we are planning museum exhibitions at the University of Oregon and Stanford University and a conference at the University of Oregon. Should we attract additional funding, we will complete our work on Barbeu de la Bruyère and Strass, and continue on to our seventeenth-century trilogy.

8. Long Term Impact

The long-term impact of our work is principally scholarly, and its principal vehicles are our online publications themselves. For the University of Oregon, the NEH award brought substantial publicity and prestige. Time Online was the first and remains the only NEH Digital Humanities award earned at the University of Oregon, and our team has been invited to prestigious venues to discuss the work. At UO, it also led to new collaborations between the Digital Scholarship Center and the Infographics Lab as well as with the Stanford Center for Spatial and Textual Analysis and the Digital Humanities Group at the Max Planck Institute for the History of Science. The project has also been highly instructive within our home institution, allowing us to better understand and assess what sorts of continuing organizational structures and resources are necessary to support a productive and sustainable digital humanities environment.

BUILDING KNOWLEDGE

Summer 2016



UNIVERSITY OF OREGON Libraries

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BRINGING OUR BEST SELVES TO THE TABLE

A STRATEGIC THEME running through our library initiatives this academic year is *Strengthening the Core*. This manifests itself in a myriad of positive ways, from the UO Libraries’ reinvigorated teaching efforts and dynamic research guides, to the preservation of priceless collections and the continued construction of our Price Science Commons and Research Library.

Key among these initiatives, however, is our focus on collaboration. We know that partnering with students, faculty, and community members makes us more effective, and leads to innovative, impressive results virtually every time. We are *greater together* than we are apart, which was the theme we created for the international Pacific Rim Research Libraries Alliance (PRRLA) meeting held this past October in the Knight Library.

Even as we transform our teaching, services, and collections to meet the ever-changing needs of students and faculty, we know that what differentiates us from other academic units is our unique role in relation to scholarly information, our position at the intersection of multiple disciplines, and our charge to serve all university constituents. For this reason, we collaborate heavily with other libraries to develop major digital platforms and systems to extend the reach of our work. Our collective accomplishments have caused a rising tide of positive change throughout our institutions, our communities, and the world. I continue to believe passionately that we are better collaborators when we are well versed and proudly confident in the library and information science specializations we bring to the table.

While the UO Libraries collaborates heavily on the national and regional level with large library consortia, such as the Orbis Cascade Alliance and the Greater Western Library Alliance, you’ll learn in this issue of *Building Knowledge* that we have increased our engagement with internal partners as well. Our librarian-faculty partnerships lead to fascinating, award-winning projects such as Professor Daniel Rosenberg’s *Time Online*. They have led to the creation of numerous cultural enrichment resources, such as Associate Professor Lara Bovilsky’s *Time’s Pencil*, an in-depth, historical companion piece for the Shakespeare’s First Folio exhibit. Our collaborations with students produce outstanding results as well, as described in an article about Jenna Mogstad and her contributions to our Wayfinding Project. Another article describes the extensive processing and indexing that Lauren Goss provides for the UO Athletics film collection, which was the impetus for an exciting discovery.

To be a true partner or strong player at the table, a vibrant research library needs to have a solid understanding of its unique mission, deeply engaged staff and faculty librarians, high-quality collections, and excellent technological capacity. In times of funding and staffing constraints, these factors would not be possible to attain without our donors’ generous support. I am in awe of the fact that your gifts to the UO Libraries reached levels that helped us surpass our campaign goals this year. Thank you for believing in us and for the help you provide as we work toward our ambitious goals. By partnering with you, we are able to continue our efforts to improve the world through outstanding library teaching and service—one interaction, one partnership, and one curious mind at a time.

With appreciation,

Adriene Lim
Dean of Libraries and Philip H. Knight Chair

Digital Age/Paper Machines

Together, Professor Daniel Rosenberg and the UO Libraries Digital Scholarship Center are developing new, interactive tools for visualizing and understanding history. Built of computer scripts, they are tools for the digital age. But the roots of their inspiration reach down to a different era entirely. The age of print.

By Jason Stone

WHEN YOU THINK OF HISTORY, do you think of a line? If so, you're certainly not alone. The "timeline" as a form of symbolic thinking has become so commonplace as to be taken for granted. To most of us it feels objective, perfectly natural. Timelines are a basic part of our graphical vocabulary, recognized by almost everyone, solid and fundamental things like the symbols for + and =. Timelines seem obvious.

In actual fact, they are a relatively recent innovation. "For timelines as we know them—straight lines measured off with dates—you can locate their emergence very precisely. The first important ones appear in the 1750s," says Daniel Rosenberg, who teaches history in the University of Oregon's Robert D. Clark Honors College.

Over the years Rosenberg has developed an enduring interest in timelines, along with other systems for tabulating and retaining historic information. Conducting his research, he accumulated an impressive collection of antique charts, games, graphs, and assorted ephemera—all designed to help learners retain and make sense of history. He wanted to share with others not only the historic knowledge contained in these paper artifacts, but also something like the hands-on experience of working with them. In his mind, a new project was stirring.

"There are always new digital tools coming out. It's a lot to keep up with," says Sheila Rabun, project manager and interim director of the UO Libraries Digital Scholarship Center (DSC). "More and more we are finding that faculty want to use digital tools and online platforms to do their research, analysis, and dissemination. We encourage them to come in and consult with us."

Daniel Rosenberg approached the library in 2013 with an intriguing idea. Rosenberg envisioned creating a suite of web-based resources to help learners make a unique and meaningful connection with the past. He was looking for a partner on the technical end to begin developing these tools.

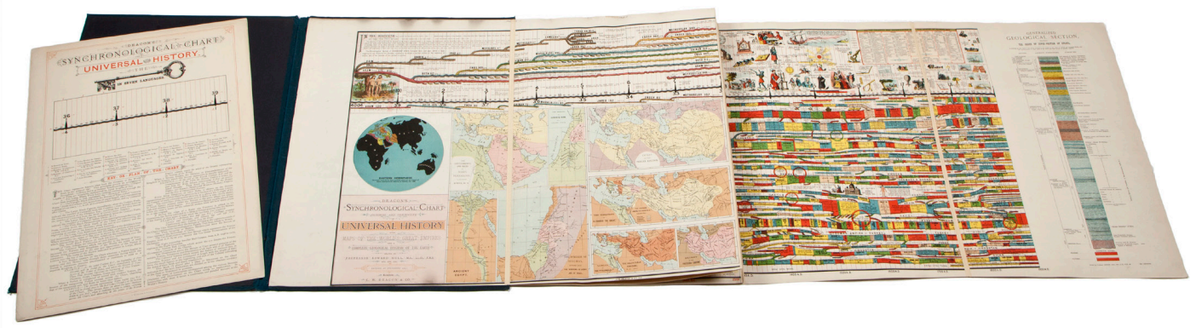
As Rosenberg puts it, "The DSC was my incubator." Out of their first conversation grew a collaborative project,

Time OnLine (pages.uoregon.edu/dbr/time-online/), which has just been awarded the prestigious Digital Humanities Start-Up Grant by the National Endowment for the Humanities (NEH) for $75,000. This is the first time the grant has been awarded at UO. This project is reintroducing the paper-based learning tools of bygone eras, presenting them in a format that makes them most accessible to the learners of today. Even for someone who knows the original materials so well, Rosenberg says, the project has opened exciting new lines of inquiry and discovery.

"We're taking historic artifacts and reimagining them in an online platform that will continue to give relevance to historic ways of doing things."

– Sheila Rabun, UO Libraries DSC

"Designing interactive digital versions of paper artifacts forces us to understand them with a detail and rigor that other kinds of historical study don't require," he explains. "Ironically, the requirements of the computer are bringing us closer to the paper artifact and to the core purposes and traditions of the library."



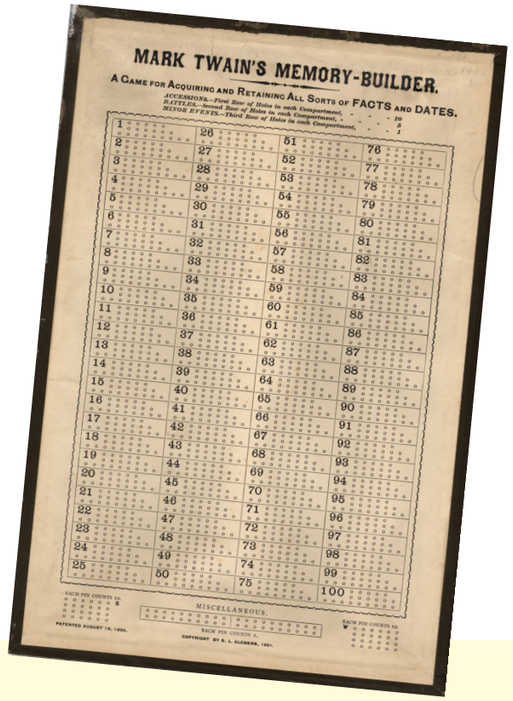
Adams Synchronological Chart or Map of History from the UO Libraries Special Collections and University Archives. First published by Presbyterian missionary Sebastian C. Adams in 1871, this timeline has been updated a number of times and is still in print.

STUDENTS have been struggling to memorize names and dates practically since the invention of historical study itself. Contemporaries of the great historians Herodotus and Thucydides were memorizers on a literally epic scale. The ancient "arts of memory" endured through the Middle Ages and were widely celebrated during the Renaissance. "In the sixteenth century and into the seventeenth," Rosenberg says, "learned people were expected to master and memorize vast amounts of information."

But in the subsequent century, during the Age of Enlightenment—the historical period in which Rosenberg specializes—there was a fundamental shift in attitudes towards the memory arts. Explains Rosenberg: "The Enlighteners basically said, 'So much memorization is a waste of intellectual resources; what do you think books are for?' So they innovated new tools such as the alphabetic encyclopedia in order to help relieve the burden of memorization, so that we could expend our intellectual energies on more creative things. Even so, there were certain areas of learning where memorization was still considered fundamental. History was one of them."

Much of Rosenberg's research work deals with Enlightenment-era information devices. However: "A bit like George Lucas, with Time OnLine we started telling our story at a later point in the larger narrative. A memory-training board game designed by Mark Twain was the first artifact we built."

Twain patented and published *Mark Twain's Memory-Builder*, a game of historical trivia, in 1892. Rosenberg, in his Chapman Hall office brimming with books and interesting old things, produces the game in its original analog format: a punchboard vaguely suggestive of a racing form and a small box of pins in two colors. It was not destined to be one of Twain's more lucrative creations. The Memory-Builder sold modestly, and before long the game was consigned to the trivia-bin of history.



The author of *Huckleberry Finn* and *Life on the Mississippi* was a hardworking genius and by all accounts a tremendous history buff. Rosenberg speculates that he may have been imagining players of equal mettle when designing his game. Twain thought the game would be a lot of fun. But "based on a simple description, it is quite hard to understand what *Mark Twain's Memory-Builder* is for, much less how to use it. Unless, that is, memorizing names and dates is second nature to you."

No problem. Expert play is optional for today's users. In fact, scoring points by calling out the important events of 1341 or 1637 is no longer even the main objective. In the digital realm, exploring the game with an open mind is the

Talking Timelines with Daniel Rosenberg

Building Knowledge: What's the nature of your research and academic training?

Daniel Rosenberg: My work in general is about the history of information. My training is in eighteenth-century European intellectual history; essentially, the Enlightenment. My work on that period mostly has to do with information devices like dictionaries and encyclopedias.

BK: How did your affinity for these artifacts lead you to your current interest in developing digital learning resources?

DR: When I was working on a book called *Histories of the Future* (Duke University Press, 2005), I became very interested in Ted Nelson, the theorist who came up with the terms *hypertext* and *hypermedia* in the 1960s. Before the graphical user interface—when computing still was command-line—Nelson was already thinking about visualizing texts, about nonlinear text. In the terms of his argument, a print encyclopedia with cross-references, alphabetical indexing, and so forth is already a fully featured hypertext. I think of it all as a continuity of technologies. My friend, the media historian Markus Krajewski, refers to information artifacts from before the electronic age as 'paper machines.' I think that very nicely captures the idea.

BK: When did you become interested specifically in timelines?

DR: A number of years ago, some colleagues organized a conference on campus, on the topic of objects and objectivity. They asked a bunch of people from various academic fields to come and talk about characteristic objects from their discipline. On one panel, there was an English professor talking about a novel. On another was an art historian talking about a painting. Well, here I was, a historian, and it's not at all clear what the paradigmatic object of history could even be. As a joke, I brought in a timeline: "This is the object of history." At the time, this was a joke because historians don't really study timelines the way that art historians study paintings or literary critics study novels; we use timelines to study other things. But it got me thinking . . . what would happen if I treated the timeline as an object of historical inquiry?

BK: So now there was at least one historian studying timelines. And it eventually led to a book you co-authored with Anthony Grafton of Princeton University, *Cartographies of Time: A History of the Timeline* (Princeton Architectural Press, 2010).

DR: The honor was mine, because Anthony Grafton is an intellectual giant in our discipline. We were introduced by a mutual acquaintance from *Cabinet* magazine; it turns out that Grafton had begun writing about time charts around the same time I did. Eventually, our two projects merged into one.

BK: What was that book about?

DR: The question we asked in *Cartographies of Time* is, when we think about history, why do we think of a line? Why do we imagine that history looks like a yardstick? And corollary to that, have we always thought about history that way? Are there other ways? What are they? And how did this particular kind of linear representation come to seem so natural? How did it become a part of the general graphical vocabulary?

BK: Now, in the twenty-first century, your project with the DSC aims to translate artifacts of ink on paper into the language and syntax of modern computers.

DR: It works both ways. Think about the familiar vocabulary that's developed around our use of technology. When we use an iPad, we're using a "tablet." When we move through text on a computer screen, we're "scrolling." When we access the University of Oregon online, we land on the home "page."

BK: What is the ultimate aim of a digitization project like this?

DR: I would like to direct people back to the artifacts. This project is a way of opening a door—encouraging people to look differently at the graphical furniture of our everyday lives, getting people to put into question familiar objects that seem simply to be vessels for facts, data, truth, information.

BK: Has Time OnLine been a success?

DR: It's been absolutely great and I think highly productive working with the DSC and UO Libraries. Developing these tools is a cyclical process, and I think we keep getting better overall. We're working through artifacts that have very different kinds of organizational protocols. With every one of these that we do, we learn something new. Something that's missing in our contemporary information environment. Something that paper can bring back to life.

new winning strategy, because it can lead to something more than rote memorization—genuine insight into the perspectives of people who lived in another era.

"Once you start to understand the rules and you're able to play it a little," explains Rosenberg, "our online version of Twain's game gives you an intuitive understanding of the way that nineteenth-century people understood and interacted with history. It's not just a game; it's an immersive learning experience."

"It's very easy to flatten the terrain of the pre-electronic world into books. But in fact, it's a highly varied landscape with lots of different kinds of paper artifacts. Just because we are talking about the paper world doesn't mean that we're not talking about technology."

– Prof. Daniel Rosenberg

IMMERSIVE LEARNING and interactive media—the kinds that capture the learner's attention by engaging their senses—have been David McCallum's passion ever since his days as an AV aide in high school. Today he is the multimedia authoring specialist with the UO Libraries DSC.

"'Multimedia' is a word that is kind of tough to define and is out of favor a bit, but that's where my interests lie: putting together text and sound and visuals," McCallum says. "Working with computer graphics and scripting languages, I love the balance it has between the left and right brain, the logical and creative. Design is problem solving."

"And," says Rosenberg, "our design process is central to our historical investigation."

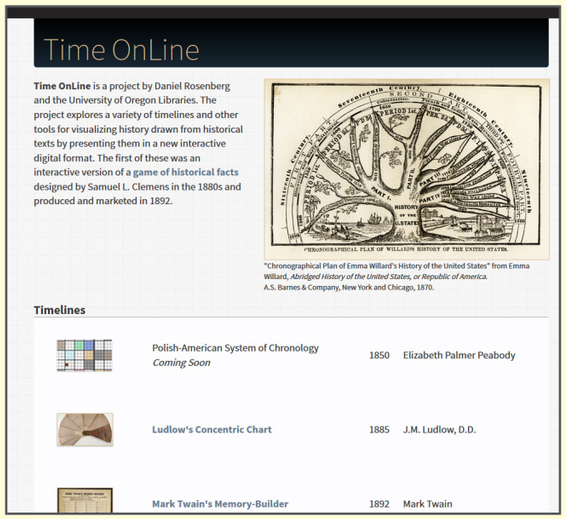
As the person charged with translating Daniel Rosenberg's vision into the language of computer scripts, McCallum has been tackling all sorts of creative challenges. And across the analog/digital divide, the challenges cut both ways.

Rabun says, "We have been trying our best to stay true to the original purpose of these games and activities. But the way some of them were originally set forth, the original instructions might not work in an online environment in terms of usability and accessibility."

By way of example, McCallum cues up the latest module of the still-in-progress project. Onscreen there appears a grid not unlike a sheet of engineer's graph paper. This is the digital incarnation of *The Polish-American System of Chronology*, published by Elizabeth Palmer Peabody in 1850. In her day the boxes were meant to be filled in by paintbrush. Peabody's instructions named an extensive palette of colors and made them correspond to various historic themes and epochs. Here's where an interesting issue of translation arises.

"There's this old language of colors," McCallum explains. "Peabody tells us to use, say, yellow ochre and gamboge. In the nineteenth century, the difference was probably common knowledge. Nowadays most people don't really think in those terms. Converting these to the digital, we need to make sure they are differentiated enough for users to recognize onscreen." At the same time, the digital artifact must evoke the historical one. It must bring the user back.

If their project engenders any sense of conflict between the old and new, Rosenberg views it as a productive friction. "For me the key intellectual component of the project is bringing the digital and the paper into confrontation with each other," he says, "using the paper, among other things, to understand what the limits of our digital technologies are."



Play the historic memory games and learn more at Time OnLine:
pages.uoregon.edu/dbr/time-online/

COLLABORATION is a constant process. "With Daniel, we still meet every two weeks," Sheila Rabun says. "It's an ongoing conversation about how he envisions it working. He talks to us to find out if that's actually doable logistically. It's really fun to help faculty see their vision coming into reality, guiding the entire process from an idea to a finished project."

From her office in the Digital Scholarship Center, she surveys a changing landscape in higher education. Her workplace is part of that landscape. While many people still associate libraries with books and quiet study spaces, her experience tells her that digital tools, resources, and platforms are the future of scholarship—not just for the university faculty and student body, but also for many types of professionals and non-traditional learners. For Rabun, there is a continuity at work.

"Libraries historically are places where people go to find information, do research and analysis, and share their scholarship," she says. "Now that we're moving into more of a digital age, what we do in digital scholarship is just an extension of the historical purpose of libraries."

"The DSC has a good history of working with instructors around campus in a consultative format," David McCallum adds. "As a library space, I think it helps make people feel comfortable that they can come in here and say, 'I have a problem. Can you help me?'"

Daniel Rosenberg shows off another of the artifacts that Time OnLine has digitized. Like a Spanish fan emblazoned with tiny typeface, *Ludlow's Concentric Chart of History*, from 1885, opens in his hand. "This one is very hard to find, and it's one of the most elegant," he enthuses. "In working with paper and the digital media together, we better understand the specificity and even the technical superiority of the old technology in many applications. Among other things, paper has infinitely better resolution. Ludlow's chart, for example, is a marvel of data compression."

In describing all these objects, the historian returns again and again to a vocabulary of sensual, aesthetic experience—they are "a pleasure to hold" and "sumptuously printed," they are "beautiful." He also finds recourse in the blunter, but no less evocative language of technical acumen—praising a "well-designed interface," a "marvel of ingenuity," its "machine precision."

"Part of what was so engaging about doing the research was operating these old, paper machines," Rosenberg reflects. "You get to understand and manipulate the historical information, but there's a whole other layer which has to do with the experience of the technology as a *technology*. What I really desire is to share that experience with others." ■